

**What Is Claimed Is:**

1           1.       An apparatus that implements a last-in first-out buffer, comprising:  
2           a plurality of cells arranged in a linear array to form the last-in first-out  
3       buffer;

4           wherein a given cell in the interior of the linear array is configured to  
5       receive get and put calls from a preceding cell in the linear array, and to make get  
6       and put calls to a subsequent cell in the linear array;

7           wherein if the given cell contains no data items, the given cell is  
8       configured to make a get call to retrieve a data item from the subsequent cell,  
9       whereby the data item becomes available in the given cell to immediately satisfy a  
10      subsequent get call to the given cell from the preceding cell without having to  
11      wait for the data item to propagate to the given cell from subsequent cells in the  
12      linear array; and

13          wherein if the given cell contains no space for additional data items, the  
14      given cell is configured to make a put call to transfer a data item to the subsequent  
15      cell, whereby space becomes available in the given cell to immediately satisfy a  
16      subsequent put call to the given cell from the preceding cell without having to  
17      wait for data in the given cell to propagate to subsequent cells in the linear array.

1           2.       The apparatus of claim 1, wherein communications between the  
2       plurality of cells take place asynchronously without reference to a system clock  
3       signal.

1           3.       The apparatus of claim 1, wherein the given cell includes:  
2       a master location for storing a data item; and

3 a slave location for temporarily storing a new data item during a put  
4 operation to the given cell until a preexisting data item in the master location can  
5 be moved to the subsequent cell to make room for the new data item.

1 4. The apparatus of claim 1, wherein the given cell includes a first  
2 location and a second location for storing data items.

1 5. The apparatus of claim 1, wherein the given cell includes a first  
2 location, a second location and a third location for storing data items.

1 6. The apparatus of claim 1, wherein the given cell includes more  
2 than three locations for storing data items.

1 7. The apparatus of claim 1, wherein each cell in the linear array  
2 includes circuitry to determine if all subsequent cells in the linear array are  
3 completely full.

1 8. The apparatus of claim 1, wherein each cell in the linear array  
2 includes circuitry to determine if all subsequent cells in the linear array are empty.

1 9. An apparatus that implements a last-in first-out buffer, comprising:  
2 a plurality of cells arranged in a linear array to form the last-in first-out  
3 buffer;

4 wherein a given cell in the interior of the linear array is configured to  
5 receive get and put calls from a preceding cell in the linear array, and to make get  
6 and put calls to a subsequent cell in the linear array;

7 wherein if the given cell contains no data items, the given cell is  
8 configured to make a get call to retrieve a data item from the subsequent cell,  
9 whereby the data item becomes available in the given cell to immediately satisfy a  
10 subsequent get call to the given cell from the preceding cell without having to  
11 wait for the data item to propagate to the given cell from subsequent cells in the  
12 linear array;

13 wherein if the given cell contains no space for additional data items, the  
14 given cell is configured to make a put call to transfer a data item to the subsequent  
15 cell, whereby space becomes available in the given cell to immediately satisfy a  
16 subsequent put call to the given cell from the preceding cell without having to  
17 wait for data in the given cell to propagate to subsequent cells in the linear array;

18 wherein communications between the plurality of cells take place  
19 asynchronously without reference to a system clock signal;

20 wherein each cell in the linear array includes circuitry to determine if all  
21 subsequent cells in the linear array are completely full; and

22 wherein each cell in the linear array includes circuitry to determine if all  
23 subsequent cells in the linear array are empty.

1 10. The apparatus of claim 9, wherein the given cell includes:  
2 a master location for storing a data item; and  
3 a slave location for temporarily storing a new data item during a put  
4 operation to the given cell until a preexisting data item in the master location can  
5 be moved to the subsequent cell to make room for the new data item.

1 11. The apparatus of claim 9, wherein the given cell includes a first  
2 location and a second location for storing data items.

1           12.    The apparatus of claim 9, wherein the given cell includes a first  
2   location, a second location and a third location for storing data items.

1           13.    The apparatus of claim 9, wherein the given cell includes more  
2   than three locations for storing data items.

1           14.    A method for implementing a last-in first-out buffer, wherein the  
2   method operates within a plurality of cells arranged in a linear array to form the  
3   last-in first-out buffer, wherein a given cell in the interior of the linear array is  
4   configured to receive get and put calls from a preceding cell in the linear array,  
5   and to make get and put calls to a subsequent cell in the linear array, the method  
6   comprising:  
7           making a get call from the given cell to retrieve a data item from the  
8   subsequent cell if the given cell contains no data items, whereby the data item  
9   becomes available in the given cell to immediately satisfy a subsequent get call to  
10   the given cell without having to wait for the data item to propagate to the given  
11   cell from subsequent cells in the linear array; and  
12           making a put call from the given cell to transfer a data item to the  
13   subsequent cell if the given cell contains no space for additional data items,  
14   whereby space becomes available in the given cell to immediately satisfy a  
15   subsequent put call to the given cell without having to wait for data in the given  
16   cell to propagate to subsequent cells in the linear array.

1           15.    The method of claim 14, wherein communications between the  
2   plurality of cells take place asynchronously without reference to a system clock  
3   signal.

10091954.030500

1           16.     The method of claim 14,  
2           wherein the given cell includes a master location and a slave location for  
3 storing data items; and  
4           wherein during a put operation to the given cell involving a new data item,  
5 the new data item is temporarily stored in the slave location until a preexisting  
6 data item in the master location can be moved to the subsequent cell to make  
7 room for the new data item.

1           17.     The method of claim 14, wherein the given cell includes a first  
2 location and a second location for storing data items.

1           18.     The method of claim 14, wherein the given cell includes a first  
2 location, a second location and a third location for storing data items.

1           19.     The method of claim 14, wherein the given cell includes more than  
2 three locations for storing data items.

1           20.     The method of claim 14, further comprising monitoring signals  
2 from subsequent cells in the linear array to determine if the subsequent cells are  
3 completely full.

1           21.     The method of claim 14, further comprising monitoring signals  
2 from subsequent cells in the linear array to determine if all the subsequent cells  
3 are empty.